

# Orders for Adults with DKA and Hyperglycemic Hyperosmolar State (HHS)



*These orders may be initiated in the Emergency Department*

DKA: Moderate ketonemia, arterial pH <7.3, serum glucose >250 mg/dL, serum bicarbonate <18 mEq/L  
 HHS: Serum glucose >600 mg/dL, minimal ketonemia or ketonuria, serum bicarbonate >15 mEq/L, pH ≥7.3

Admit	Date: _____ Time: _____ Location: _____ Attending _____
Diagnosis	
Drug allergies or adverse reactions	<input type="checkbox"/> No known drug allergies <input type="checkbox"/> List: _____
Monitor and Record	1. Vital signs & I&O every hour until stable, then every 2 hours x 24 hours <input type="checkbox"/> Insert Foley if no urine output within first hour or within _____ hours 2. STAT fingerstick (capillary) blood glucose (Use venous or arterial draw if glucose >450 or <45 mg/dL or SBP <60 mmHg) <input type="checkbox"/> Neuro checks every 2 hours (maintain seizure precautions) x 24 hours
Diet	<input type="checkbox"/> NPO <input type="checkbox"/> Ice Chips <input type="checkbox"/> Other: _____
Activity	<input type="checkbox"/> Bed rest <input type="checkbox"/> Bathroom privileges with assistance <input type="checkbox"/> Other: _____
Admission lab	<input type="checkbox"/> STAT Metabolic Profile (Glucose, BUN, Creatinine, Na, K, Cl, HCO <sub>2</sub> , Ca) <input type="checkbox"/> Serum ketones <input type="checkbox"/> Serum PO <sub>4</sub> , Mg <input type="checkbox"/> Arterial blood gas <input type="checkbox"/> CBC with diff. <input type="checkbox"/> Blood cultures x 2 <input type="checkbox"/> Urine C&S <input type="checkbox"/> A1c <input type="checkbox"/> TSH <input type="checkbox"/> β-hydroxybutyrate <input type="checkbox"/> Serum osmolarity (measured) <input type="checkbox"/> Record acidosis-ketosis gap (AKG = arterial pH – plasma β-hydroxybutyrate. AKG >3 may indicate drug abuse <sup>5</sup> ) <input type="checkbox"/> Other: _____
Additional labs & studies	<input type="checkbox"/> K and HCO <sub>3</sub> every _____ hour(s). Call results to physician (hourly monitoring is recommended) <input type="checkbox"/> Metabolic profile every 4 hours x 24 hours. <input type="checkbox"/> Call results to physician _____ <input type="checkbox"/> Ca, PO <sub>4</sub> , Mg every _____ hours x 24 hours. <input type="checkbox"/> Call results to physician _____ <input type="checkbox"/> Record anion gap      AG = (Na) – (Cl + HCO <sub>3</sub> ) <input type="checkbox"/> EKG <input type="checkbox"/> Chest X-ray <input type="checkbox"/> Portable chest X-ray  <input type="checkbox"/> Culture and sensitivity of: _____ <input type="checkbox"/> Other: _____
Initial IV fluids	Run IV at _____ ml per hour for _____ hours (Adjust for fluid volume already given in ER) <input type="checkbox"/> Use 0.9% NaCl if corrected sodium is low (less than _____ mEq/L) <input type="checkbox"/> 0.45% NaCl if corrected serum sodium is normal or elevated (Corrected sodium: Add 1.6 mEq to Na lab value for each 100 mg/dL glucose greater than 100 mg/dL)  <input type="checkbox"/> Other: _____
Mix standard insulin drip	<b>Discontinue all previous insulin orders</b> <input type="checkbox"/> Mix 100 units Regular insulin in 100 mL NS <input type="checkbox"/> Other: Mix _____ units of _____ insulin in _____ mL NS
Give initial IV insulin bolus	<input type="checkbox"/> Bolus _____ units Regular insulin IV (recommend 10-15 units Regular insulin IV) <input type="checkbox"/> Other: Bolus _____ units of _____ insulin in _____ mL NS
Start insulin infusion	Start insulin infusion at _____ units per hour Recommend infusion rate is calculated as: Glucose mg/dL ÷ 100 (Ex: Glucose=350 → Start 3.5 units/h)

Target range for glucose	<p>Rate of glucose reduction not to exceed 100 mg/dL per hour</p> <p><b>DKA:</b> <input type="checkbox"/> 100 to 130 mg/dL      <input type="checkbox"/> Other _____</p> <p><b>HHS:</b> <input type="checkbox"/> Low target:                      <input type="checkbox"/> High target:</p>																																																																																																																								
Monitor glucose every hour	<p>Obtain <i>lab</i> glucose if fingerstick blood glucose is &gt;450 or &lt;45 mg/dL or SBP &lt;60 mmHg</p> <p><input type="checkbox"/> Change frequency of glucose monitoring to:</p>																																																																																																																								
Adjust insulin infusion rate	<p>Note: No patient begins on Algorithm 3 or 4 without endocrine service authorization</p> <p><input type="checkbox"/> Start on Algorithm 1</p> <p><input type="checkbox"/> Start on Algorithm 2 (Consider if s/p CABG, transplant, glucocorticoid therapy, &gt;80 U/d insulin)</p> <ul style="list-style-type: none"> <li>• Move up or down on the same algorithm each hour if glucose remains outside target range</li> <li>• Advance one algorithm column (i.e. 1→2, etc.) if glucose is outside the target range at highest infusion rate</li> <li>• Treat for hypoglycemia if glucose is &lt;60 mg/dL</li> <li>• Decrease one algorithm column (i.e. 2→1, etc.) if glucose is 60-69 mg/dL x 2 or decreases &gt;60 mg/dL in 1 hour</li> </ul> <table border="1"> <thead> <tr> <th colspan="2">Algorithm 1</th> <th colspan="2">Algorithm 2</th> <th colspan="2">Algorithm 3</th> <th colspan="2">Algorithm 4</th> </tr> <tr> <th>BG</th> <th>units/h</th> <th>BG</th> <th>units/h</th> <th>BG</th> <th>units/h</th> <th>BG</th> <th>units/h</th> </tr> </thead> <tbody> <tr> <td colspan="8" style="text-align: center;"><b>&lt;60 = Hypoglycemia</b></td> </tr> <tr> <td>&lt;70</td> <td>Off</td> <td>&lt;70</td> <td>Off</td> <td>&lt;70</td> <td>Off</td> <td>&lt;70</td> <td>Off</td> </tr> <tr> <td>70–109</td> <td>0.2</td> <td>70–109</td> <td>0.5</td> <td>70–109</td> <td>1</td> <td>70–109</td> <td>1.5</td> </tr> <tr> <td>110–119</td> <td>0.5</td> <td>110–119</td> <td>1</td> <td>110–119</td> <td>2</td> <td>110–119</td> <td>3</td> </tr> <tr> <td>120–149</td> <td>1</td> <td>120–149</td> <td>1.5</td> <td>120–149</td> <td>3</td> <td>120–149</td> <td>5</td> </tr> <tr> <td>150–179</td> <td>1.5</td> <td>150–179</td> <td>2</td> <td>150–179</td> <td>4</td> <td>150–179</td> <td>7</td> </tr> <tr> <td>180–209</td> <td>2</td> <td>180–209</td> <td>3</td> <td>180–209</td> <td>5</td> <td>180–209</td> <td>9</td> </tr> <tr> <td>210–239</td> <td>2</td> <td>210–239</td> <td>4</td> <td>210–239</td> <td>6</td> <td>210–239</td> <td>12</td> </tr> <tr> <td>240–269</td> <td>3</td> <td>240–269</td> <td>5</td> <td>240–269</td> <td>8</td> <td>240–269</td> <td>16</td> </tr> <tr> <td>270–299</td> <td>3</td> <td>270–299</td> <td>6</td> <td>270–299</td> <td>10</td> <td>270–299</td> <td>20</td> </tr> <tr> <td>300–329</td> <td>4</td> <td>300–329</td> <td>7</td> <td>300–329</td> <td>12</td> <td>300–329</td> <td>24</td> </tr> <tr> <td>330–359</td> <td>4</td> <td>330–359</td> <td>8</td> <td>330–359</td> <td>14</td> <td>330–359</td> <td>28</td> </tr> <tr> <td>&gt;360</td> <td>6</td> <td>&gt;360</td> <td>12</td> <td>&gt;360</td> <td>16</td> <td>&gt;360</td> <td>32</td> </tr> </tbody> </table>	Algorithm 1		Algorithm 2		Algorithm 3		Algorithm 4		BG	units/h	BG	units/h	BG	units/h	BG	units/h	<b>&lt;60 = Hypoglycemia</b>								<70	Off	<70	Off	<70	Off	<70	Off	70–109	0.2	70–109	0.5	70–109	1	70–109	1.5	110–119	0.5	110–119	1	110–119	2	110–119	3	120–149	1	120–149	1.5	120–149	3	120–149	5	150–179	1.5	150–179	2	150–179	4	150–179	7	180–209	2	180–209	3	180–209	5	180–209	9	210–239	2	210–239	4	210–239	6	210–239	12	240–269	3	240–269	5	240–269	8	240–269	16	270–299	3	270–299	6	270–299	10	270–299	20	300–329	4	300–329	7	300–329	12	300–329	24	330–359	4	330–359	8	330–359	14	330–359	28	>360	6	>360	12	>360	16	>360	32
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Treat hypoglycemia	<ol style="list-style-type: none"> <li>• Glucose &lt;40 mg/dL: Give 1 ampule D50W (25 grams) by slow IV push over 30 seconds <ul style="list-style-type: none"> <li>• Decrease insulin infusion by moving down 1 algorithm (i.e. 2→1, etc.)</li> <li>• Recheck glucose in 15 minutes; repeat D50W, as above, if necessary</li> </ul> </li> <li>• Glucose 40-59 mg/dL: Give ½ ampule D50W by slow IV push over 30 seconds <ul style="list-style-type: none"> <li>• Recheck glucose in 15 minutes; repeat D50W, as above, if necessary</li> </ul> </li> </ol>																																																																																																																								
Maintenance IV fluids	<p>When blood glucose is:</p> <p><input type="checkbox"/> <b>DKA:</b> 200 mg/dL, change IV to D5 ½ NS and run at _____ mL/hour</p> <p><input type="checkbox"/> <b>HHS:</b> 250 mg/dL, change IV to D5 ½ NS and run at _____ mL/hour</p> <p><input type="checkbox"/> <b>Other:</b> _____</p> <p>For patients at risk of volume overload, consider D<sub>10</sub>W or D<sub>50</sub>W (Infuse D<sub>50</sub> via central line using infusion pump)</p> <p>Note: HHS: Maintain blood glucose at 250-300 mg/dL until plasma osmolarity is ≤315 mOsm/Kg</p>																																																																																																																								
Potassium replacement	<p><b>Call physician if K is &lt;3 or &gt;6 mEq/L</b> (Note: Urine output should be &gt;30 mL/hour before starting K<sup>+</sup> replacement)</p> <p>Add KCl to IV fluids:</p> <ul style="list-style-type: none"> <li>• If K is &lt;3.3 mEq/L, add 30 mEq KCl/L of IV fluid</li> <li>• If K is 3.3- 5.2 mEq/L add 20 mEq KCl/L IV fluid to maintain K between 4-5 mEq/L</li> <li>• If K<sup>+</sup> is &gt;5.2 mEq/L, hold KCl</li> <li>• Consider KPO<sub>4</sub> instead of KCl if serum PO<sub>4</sub> is low</li> </ul> <p><input type="checkbox"/> <b>Other:</b> _____</p>																																																																																																																								

Phosphorus replacement	Consider if evidence of alcohol abuse, malnutrition, etc. <input type="checkbox"/> Give 10 mEq/L KPO <sub>4</sub> in one liter of IV fluid x 1  <input type="checkbox"/> Other: _____
Sodium bicarbonate (DKA)	<input type="checkbox"/> Give sodium bicarbonate If pH <6.9 dilute 100 mmol NaHCO <sub>3</sub> in 400 mL H <sub>2</sub> O containing 20 mEq KCl <input type="checkbox"/> Infuse over 2 hours <input type="checkbox"/> Other _____ <input type="checkbox"/> IV Push _____ ampule of NaHCO <sub>3</sub> <input type="checkbox"/> Recheck arterial pH (ABG) within _____ minutes and call results to the attending
Alert parameters for notifying physician	<ul style="list-style-type: none"> <li>• Two consecutively treatments for hypoglycemia</li> <li>• K less than _____ mEq/L</li> <li>• Withholding IV insulin infusion for &gt;1 hour with no other source of insulin</li> <li>• TPN stopped, interrupted or any change in formulation</li> <li>• Deterioration in mental status</li> <li>• Patient does not respond to above orders for glycemic control</li> </ul> <input type="checkbox"/> Other _____  <input type="checkbox"/> Other _____
Transition to SQ insulin	<input type="checkbox"/> Proceed to Texas Diabetes Council Transition Algorithm From I.V. to S.Q. Insulin  <input type="checkbox"/> Other: _____
Other orders	1. _____  2. _____  3. _____  4. _____

References:

1. American Diabetes Association. Standards of medical care in diabetes-2008. Diabetes Care. 2008;31(Suppl 1): S12-S54.
2. Kitabchi AE, Umpierrez GE, Murphy MB, et al. Hyperglycemic crises in adult patients with diabetes. A consensus statement from the American Diabetes Association. Diabetes Care. 2006;29(12):2739-2748.
3. American Diabetes Association. Hyperglycemic crises in patients with diabetes mellitus (Position Statement). Diabetes Care. 2004;27 (Suppl 1):S94-S102.
4. Clement S, Braithwaite S, Magee M, et al. Management of diabetes and hyperglycemia in hospitals (technical review). Diabetes Care. 2004;27:533-591.
5. Lee P, Greenfield JR, Campbell LV. "Mind the gap" when managing ketoacidosis in type 1 diabetes. Diabetes Care. 2008;31(7):e58.

Physician Signature \_\_\_\_\_ Date \_\_\_\_\_ Time \_\_\_\_\_